

September 21, 1976.

USE OF DEICING SALT 1975/76 SEASON

Introduction

This is a report on the use of deicing salt on State highways during the 1975-76 winter season, and other items of interest in regard to snow and ice control. Highlights include the following:

1. A tabulation of quantities by districts where salt was used.
2. A discussion on research and mitigating procedures which were implemented last season.
3. Achievements in identifying environmentally sensitive areas.
4. Procedures which minimized adverse environmental impacts.

Record keeping and control methods.

Early in 1976 the Office of Maintenance issued criteria for recording the use of salt which stated that, as a minimum, a log should be placed in every sand and salt spreading vehicle. The operator of the vehicle was to note the date, post mile limits of the spread, and the quantity of salt spread. Each district that uses salt has implemented a recording system; one has established an EDP program to monitor and record quantities.

Training

Training sessions were held on procedures for measuring salt and sand, calculating percentages, calibrating spreader devices, and clarification on statewide policy of minimizing the use of salt.

Some districts used a film from the Salt Institute showing the application of salt as a deicing chemical. Slide and talk programs from the Michigan Department of Highways which covered

"Salt, How much and Where" and "Salt Calibration" were also used in training sessions.

In addition to the above type training, valley personnel who would be working during storms were given familiarization meetings on snow removal procedures and equipment.

Quantity and Location

The tabulation displays historical use of salt (in tons) in the various districts.

<u>Dist.</u>	<u>Ave. Annual Use</u>	<u>1974-75</u>	<u>1975-76</u>
1	263	276	172
2	2303	1976	1232
3	9717	9489	6007
4	31	30	32
5	0	0	0
6	380	380	330
7 <i>Payette</i>	520	449	572
8 <i>SBNF</i>	<u>1880</u>	<u>1554</u>	<u>736</u>
9	650	910	555
10	400	520	314
11	1000	1196	755
Total	17144	16780	10705 (62% of Ave.)

Because of the relatively mild winter in 1975-76 it is not possible to determine how much of the reduction in use is due to our salt use minimization policy. Nevertheless, a 33% reduction in use is significant.

Spreaders

Three different types of salt spreaders were used and evaluated during the past winter.

1. Swenson Slip-in bin spreaders deliver a very controlled spread of material. Very small amounts can be spread over a variety of widths.
2. Duo-Servo units adjust output to a predetermined amount of material based on the actual ground speed of the truck.
3. The "Epoke" Spreader was satisfactory in some respects and unsatisfactory in others. This unit gives a uniform spread within a confined width. None of the material is wasted outside the lane. It worked well up to 55 mph. The main drawback with this unit was that it could not be turned on and/or off from the truck cab. There was a problem of spilling material from the hopper onto the pavement when filling the hopper.

Premixing salt and sand has been clumsy at best and inaccurate at worst. Bulk salt has been measured by count of loader hoppers and sack salt by sack count. Bulk salt is added and mixed with sand by use of front end loaders. Sack salt is placed with sand in layers in trucks with the supposition that the mix will be spread evenly as it is tailgated from the truck bed.

The letter of March 4, 1976, from the Office of Maintenance to all District Directors, pointed out that it was essential to develop a method of obtaining a uniform mixture so that the rate of application of salt (not simply the mixture as a whole) would be predetermined and controlled. Further improvement is needed here in the coming winter.

Statewide Snow and Ice Control Study

The task force that has been investigating procedures, materials, and equipment, used in snow and ice control is preparing a comprehensive report which will have several recommendations dealing with these concepts. The report is scheduled to be completed this November.

New Equipment

One idea from the task force was to develop a salt and sand mixer-spreader which will be tested this coming season. This equipment allows close control of the amount of sand and salt applied and the mix proportions can be altered at will.

Salt Specifications

The contract for salt for the coming season will specify non-kiln dried rather than kiln-dried except for that area around Lake Tahoe. This change was as a result of one of the task force's recommendations.

The specifications for salt purchase for contaminant levels of elements in deicing salt have been set in accordance with the recommendations in the final report "A Study of the Influence of Highway Deicing Agents on Aquatic Environment in the Lake Tahoe Basin and Drainages Along Interstate 80" by Dr. Charles Goldman of Ecological Research Associates. The contaminant levels were set to assure that any salt which reaches bodies of water in runoff does not stimulate or inhibit natural plankton communities. High contaminant levels could provide nutrients and a fertilizing effect on aquatic ecosystems.

Research

Water quality - A research project titled "Survey Study of Deicing Salt Impacts on Roadside Lakes and Ponds" was approved April 16, 1976. The purpose of the study is to survey lakes and ponds in California that are influenced by salt laden waters from highway deicing operation to determine if the basin morphology and relationship to highway runoff is conducive to accumulations of salt. Questionnaires have been completed by the districts and field review and sampling is now in progress by Translab. This study is the follow-up to expand statewide the work completed by Dr. Goldman in "A Study of the Influence of Highway Deicing Agents on the Aquatic Environment in the Lake Tahoe Basin and Drainages Along Interstate 80".

Highway Operation and Plant Damage - This project to quantify salt concentrations in drainages and soils along roadways, determine photochemical pollutant concentrations, survey plant damage, develop screening methods between and within species for salt tolerance and develop alternative solutions to minimize or alleviate plant damage has fallen behind schedule due to the delay in signing the Research Technical Agreement between the University of California at Davis and the Federal Highway Administration. A research assistant has been added to the University staff to facilitate production of a final report in June 1977.

One hundred and fifteen vegetative samples were obtained this spring from the 15 established test sites. Samples were obtained from green, partially damaged, and dead portions of various species. The samples have been analyzed for sodium and chloride content. From the available limited data, suggestion of a critical level of Na and Cl in the soil and in plants at which plant damage will occur would be misleading.

To date there has been poor correlation between the greenhouse studies and field samples. Because of this and further observations in the study areas, a major shift in emphasis is planned. Additional field work will be undertaken where several sites will be selected for intensive inventory of the tree populations. Data will be taken on the percentage of normal and distressed trees and this will be correlated with (1) sodium and chloride content of tissues, (2) distance from the highway, (3) depth of fill over roots, (4) incidence of root rot, and (5) incidence of bark beetle. Other observations will be made as seems worthwhile.

In June, one of these new sites was laid out near Bliss State Park. A complete inventory of the trees in the sample plot was taken, crown depth of three rows of white fir trees was measured, and soil analysis was made at intervals of 2, 10, 20, 30, and 300 feet from the highway.

In addition, sites are being sought where salt applications can be made in the field to develop distress symptoms and to determine the salt levels which cause damage to vegetation in the test area.

Relationship Between Accidents and the Use of Salt - The objectives of this four-year research project (which has not yet received FHWA funding approval) are to (1) determine what impacts there are on traffic safety in California if salt is not used, (2) determine the safety effectiveness of an alternative method of increased use of sand and cinders, and (3) develop predictive methods to estimate changes in safety due to no-salt use in particular locations.

Basically the approach will be to analyze a before and after accident study focused in the no-salt test section in the vicinity of Emerald Bay with a control section immediately to the north. The accident data will include forms completed by Caltrans maintenance personnel and CHP personnel; accidents which would normally not be reported on regular accident report forms.

Following collection of data this winter, an analysis will be made which may enable us to determine cause and effect factors of salt usage. An interim report will be published next summer.

Identification of Environmentally Sensitive Areas

The districts have made field reviews to identify those areas where salt is used that are potentially environmentally sensitive. This review was made on the basis of the parameters which our research in water quality and vegetation damage indicated may be important. Additional and continuing effort is needed in this area and will be expended in the coming winter season.

Those areas identified as potentially environmentally sensitive include:

- Route 5 in Shasta and Siskiyou Counties from north of Redding to the Oregon State line.
- The entire Tahoe Basin area.
- Route 38 in San Bernardino County from Camp Angelus to the south fork of the Santa Ana River.
- A number of drainage areas in Inyo, Mono, and Kern Counties.

- Jeffrey pine forests on Route 395 in Mono County in Walker River Canyon and the Mammoth-June Lake vicinity.
- Agricultural areas near Tehachapi.

Areas that are not environmentally sensitive to the amounts of salt used in California deicing practice have also been identified. These include:

- Palmdale reservoir and Pyramid Lake in Los Angeles County.
- Lake Silverwood, Lake Arrowhead, and Big Bear Lake in San Bernardino County.
- Desert areas in Inyo and Kern Counties.

Mitigating Measures

In addition to the control methods described previously, here are some additional mitigating measures which the districts have reported:

- Route 89 - The 10 mile no salt test section on Route 89 in the vicinity of Emerald Bay in El Dorado County was identified in the Final EIR. The vegetation in the test area is typical of the vegetation in the entire Lake Tahoe Basin and perhaps one of the most critical areas from the standpoint of environmental sensitivity. The drainages include Taylor Creek, Spring Tallac Creek, Cascade Creek, Cascade Lake, Emerald Bay and Tahoe. Trees and shrubs of various species in this micro-environment include Jeffrey pine (*Pinus jeffreyi*), Ponderosa pine (*Pinus ponderosa*), Sugar pine (*Pinus lambertiana*), Ledgepole pine (*Pinus contorta*), Incense cedar (*Calocedrus decurrens*), Quaking aspen (*Populus tremuloides*), White fir (*Abies concolor*), Shasta fir (*Abies magnifica*), Sierra juniper (*Juniperus occidentalis*), Pinemat manzanita (*Arctostaphylos nevadensis*), Squaw carpet (*Ceanothus prostratus*), Butterbrush (*Pershia tridentata*), Big sagebrush (*Artemesia tridentata*), Mountain elderberry (*Sambucus microbotrys*), Manzanita (*Arctostaphylos manzanita*), also included are two more varieties of Ceanothus, *Salix chrysanthus*, *Cistus* and some grass species.

Monitoring of the test section began in November, 1975. About 10% of all the trees in the test section show some symptoms of banding. Another 40% of the trees on the south end of the section are demonstrating pathogenic symptoms (*Elelyteczadarma* *Scolytus Fungi*).

After a dry winter requiring a minimum of snow removal operations and with the elimination of salt, a total of 73 dead trees were counted in the test area. The Aspens, Junipers, shrubs and grass species show no signs of injury.

- Route 33 - North of Ojai in Ventura County no salt was used during the past winter nor will it be used in the future. The first year salt was used on this route was 1970 and use has been minimal on a few local spots where ice was a chronic problem. There is no indication that past salt usage adversely affected the native chaparral in the lower areas or the sparsely covered areas of sage brush or scattered pinyon growth.
- Routes 2 and 39 - During the past mild winter no salt was used on these routes in Los Angeles County through the Angeles National Forest. In mild winters cinders alone are adequate in this area.
- Route 38 - In San Bernardino County an extensive test area for no salting has been established for the coming winter season. This will be a portion of the route between Camp Angelus and the South Fork of the Santa Ana River where a preliminary study conducted by the U. S. Forest Service indicated possible deicing salt injury to conifers bordering the highway.
- Routes 163 and 395 - No salt was used on these routes west or south of Bishop in Inyo County.

Conclusion

Various methods to measure salt used were implemented throughout the State last year. Some districts used straight salt from calibrated spreaders in order to achieve more accurate control. The amount of salt used last season was 38% below the annual average. Training sessions and explicit supervision have accentuated the importance of minimizing salt use and in keeping accurate records of where and in what quantities salt is used. The documentation of use is important so that the ongoing research results on the environmental effects of salt use can be implemented as early as possible.

Additional new spreaders will be put in service this coming winter which will permit more accurate control of the use of salt. These units should help further reduce the amount used.

The report and recommendations from the Snow and Ice Control Procedures Study is an important part of our ongoing effort in improving winter maintenance practices. When that report becomes available in November, further modifications may result to our snow and ice control practices.



DEPARTMENT OF TRANSPORTATION

DISTRICT 8, P. O. BOX 231
SAN BERNARDINO, CALIFORNIA 92403

October 18, 1976

Wilfred Freeman

Mr. Wes Hamilton
144 North Mt. View Avenue
San Bernardino, CA 92408

Dear Wes:

At the Southern Committee meeting of the California Forest Pest Action Council on October 14, 1976, you requested a copy of the summary report on the use of deicing salt.

The enclosed report "Use of Deicing Salt 1975/76 Season" provides a summary of statewide use of deicing salt by the Department of Transportation. The report summarizes the research currently under way, identifies potential environmentally-sensitive areas to be studied in greater depth, and describes mitigating measures, some of which have been implemented, and others which will be implemented this coming winter.

The California Department of Transportation shares your concern for forest protection and desires to obtain a practical balance in providing safe roadway conditions for the traveling public with minimal environmental degradation.

If you have any questions on this report, please contact me at
(714) 383-4042.

Sincerely,

Robert H. Charlton

Robert W. Austin
Environmental Engineer

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